

CLAIMS

1. A program for decoding coded data, which causes a computer to function
as: a first projection means for receiving an input of a signal coded by lossy
5 compression and orthogonally projecting an optional real number vector on one
convex aggregate X in a first vector space in which the decoded signal is present;
convergence judgment means for judging convergence of convex projection through
the first projection means and obtaining a real number vector x belonging to the
aggregate X to output the same as a decoded signal when the convergence of the
10 convex projection is judged; and a second projection means for orthogonally
projecting an optional vector of the first vector space on one convex aggregate Y in
the second vector space different from the first vector space when the convergence
of the convex projection is not judged, and then moving to the first projection means
to repeat orthogonal projection on the aggregate X and the aggregate Y with the
15 coded signal set as an initial value.

2. The program for decoding coded data according to claim 1,
characterized in that the aggregate X and the aggregate Y are defined as aggregates
of vectors in which a range of values to be taken by each component is limited.

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3. The program for decoding coded data according to claim 1, further
causing the computer to function as integer conversion means for converting the real
number vector belonging to the aggregate X into an integer vector when the
convergence of the convex projection is judged by the convergence judgment means,

end judgment means for judging whether the integer vector belongs to the aggregate Y or not, and outputting the integer vector as a decoded vector when the integer vector is judged to belong to the aggregate Y, reduction means for reducing the aggregate Y to generate a new convex aggregate W which is its partial aggregate
5 when the integer vector is judged not to belong to the aggregate Y, and a third projection means for orthogonally projecting the converted integer vector on the convex aggregate W, and then moving to the first projection means to execute orthogonal projection between the aggregate W and the aggregate X with the coded signal set as an initial value, thereby repeatedly correcting the real number vector x.

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4. The program for decoding coded data according to claim 3, characterized in that the aggregate W is defined as an aggregate of vectors in which a range of values to be taken by each component is limited, and the range is given by reducing a range of each component defining the aggregate Y by k ($k < 1$) times.

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5. The program for decoding coded data according to claim 1, characterized in that the coded signal is obtained by quantizing the vector of the second vector space by a first quantized vector, and the aggregate Y is defined as an aggregate of vectors coincident with one vector y when the vector is quantized by a
20 second quantized vector.

6. The program for decoding coded data according to claim 5, characterized in that the first quantized vector and the second quantized vector are identical to each other.

7. A method for decoding coded data, comprising:
- a first projection step of receiving an input of a signal coded by lossy compression and orthogonally projecting an optional real number vector on one convex aggregate X in a first vector space in which the decoded signal is present;
- 5 a convergence judgment step of judging convergence of convex projection through the first projection step and obtaining a real number vector x belonging to the aggregate X to output the same as a decoded signal when the convergence of the convex projection is judged; and
- 10 a second projection step of orthogonally projecting an optional vector of the first vector space on one convex aggregate Y in the second vector space different from the first vector space when the convergence of the convex projection is not judged, and then moving to the first projection step to repeat orthogonal projection on the aggregate X and the aggregate Y with the coded signal set as an initial value.
- 15 8. The method for decoding coded data according to claim 7, characterized in that the aggregate X and the aggregate Y are defined as aggregates of vectors in which a range of values to be taken by each component is limited.
9. The method for decoding coded data according to claim 7, characterized
- 20 by further comprising:
- an integer conversion step of converting the real number vector belonging to the aggregate X into an integer vector when the convergence of the convex projection is judged by the convergence judgment step;
- an end judgment step of judging whether the integer vector belongs to the

aggregate Y or not, and outputting the integer vector as a decoded vector when the integer vector is judged to belong to the aggregate Y;

a reduction step of reducing the aggregate Y to generate a new convex aggregate W which is its partial aggregate when the integer vector is judged not to

5 belong to the aggregate Y; and

a third projection step of orthogonally projecting the converted integer vector on the convex aggregate W, and then moving to the first projection step to execute orthogonal projection between the aggregate W and the aggregate X with the coded signal set as an initial value, thereby repeatedly correcting the real number vector x.

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10. The method for decoding coded data according to claim 9, characterized in that the aggregate W is defined as an aggregate of vectors in which a range of values to be taken by each component is limited, and the range is given by reducing a range of each component defining the aggregate Y by k ($k < 1$) times.

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11. The method for decoding coded data according to claim 7, characterized in that the coded signal is obtained by quantizing the vector of the second vector space by a first quantized vector, and the aggregate Y is defined as an aggregate of vectors coincident with one vector y when the vector is quantized by a
20 second quantized vector.

12. The method for decoding coded data according to claim 11, characterized in that the first quantized vector and the second quantized vector are identical to each other.

13. An apparatus for decoding coded data, comprising:
- a first projection means for receiving an input of a signal coded by lossy compression and orthogonally projecting an optional real number vector on one convex aggregate X in a first vector space in which the decoded signal is present;
- 5 convergence judgment means for judging convergence of convex projection through the first projection means and obtaining a real number vector x belonging to the aggregate X to output the same as a decoded signal when the convergence of the convex projection is judged; and
- a second projection means for orthogonally projecting an optional vector of
- 10 the first vector space on one convex aggregate Y in the second vector space different from the first vector space when the convergence of the convex projection is not judged, and then moving to the first projection means to repeat orthogonal projection on the aggregate X and the aggregate Y with the coded signal set as an initial value.
- 15 14. The apparatus for decoding coded data according to claim 13, characterized in that the aggregate X and the aggregate Y are defined as aggregates of vectors in which a range of values to be taken by each component is limited.
15. The apparatus for decoding coded data according to claim 13,
- 20 characterized by further comprising:
- integer conversion means for converting the real number vector belonging to the aggregate X into an integer vector when the convergence of the convex projection is judged by the convergence judgment means;
- end judgment means for judging whether the integer vector belongs to the

aggregate Y or not, and outputting the integer vector as a decoded vector when the integer vector is judged to belong to the aggregate Y;

reduction means for reducing the aggregate Y to generate a new convex aggregate W which is its partial aggregate when the integer vector is judged not to

5 belong to the aggregate Y; and

a third projection means for orthogonally projecting the converted integer vector on the convex aggregate W, and then moving to the first projection means to execute orthogonal projection between the aggregate W and the aggregate X with the coded signal set as an initial value, thereby repeatedly correcting the real number

10 vector x.

16. The apparatus for decoding coded data according to claim 15, characterized in that the aggregate W is defined as an aggregate of vectors in which a range of values to be taken by each component is limited, and the range is given by

15 reducing a range of each component defining the aggregate Y by k ($k < 1$) times.

17. The apparatus for decoding coded data according to claim 13, characterized in that the coded signal is obtained by quantizing the vector of the second vector space by a first quantized vector, and the aggregate Y is defined as an

20 aggregate of vectors coincident with one vector y when the vector is quantized by a second quantized vector.

18. The apparatus for decoding coded data according to claim 17, characterized in that the first quantized vector and the second quantized vector are

identical to each other.